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THE RISK PREDICTION MODEL FOR OUT-OF-POCKET PAYMENTS AMONG PATIENTS UNDERGOING CHEMOTHERAPY FOR COLORECTAL CANCER IN UKRAINE DURING THE WAR

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Abstract

Introduction. In Ukraine colorectal cancer (CRC) is top 3 by incidence and top 2 by mortality rate, 9.9% and 14.4% respectively. Despite recently introduced healthcare reform and resulting improvements in accessibility of health services, out-of-pocket payments (OOP payments) remain to be a serious challenge in Ukraine.
Aim. To develop a risk prediction model for OOP payments based on organizational and regional features of CRC chemotherapy, patient sociodemographic and clinical characteristics.
Materials and methods. A cross-sectional study surveyed 459 respondents undergoing chemotherapy for colorectal cancer in Ukraine. The participants were divided into two groups depending on the presence of OOP payments (121 – yes, 338 – no). Statistical data analysis was performed using the R programming language version 4.3.1 with the EZR graphical user interface version 1.64. Logistic regression was used to evaluate the impact of various factors on the risk of OOP payments.
Results. A five-variable logistic regression model was developed to predict the odds ratio (OR) of incurring OOP payments. The model demonstrated very good concordance with an area under the curve (AUC) of 0.798 (0.744-0.851). The model included the following statistically significant indicators that increased the risk of OOP payments: age 60-69 years ($p = 0.007$), treatment in the Northern and Central subregions ($p < 0.001$ and $p = 0.008$, respectively), underweight based on patient body mass index (BMI) < 18.5 ($p = 0.006$), and waiting time for treatment initiation for more than 2 months ($p = 0.017$). At the same time, being overweight with a BMI of 25.0-29.9 decreased the risk of OOP payments ($p = 0.03$). The average monthly income per household member was present in the final model, but did not demonstrate an independent statistically significant effect ($p > 0.05$).
Conclusions. The risk prediction model reveals that the risk of incurring OOP payments is primarily driven by clinical parameters (underweight, BMI < 18.5; and overweight, BMI 25.0-29.9), access to care (waiting time of more than 2 months), socio-demographic factors (age 60-69 years), and regional disparities in healthcare delivery. Actionable strategies for rapid implementation to mitigate OOP payments include optimizing healthcare organization to reduce treatment waiting times, increasing patient awareness regarding free treatment.

Keywords: **delivery of healthcare; healthcare financing; patients; health services accessibility; patient care; socioeconomic factors; body mass index; cancer**

INTRODUCTION

Cancer represents a major global public health challenge. In the United States, for example, cancer is the second leading cause of mortality. Furthermore, healthcare system disruptions caused by the COVID-19 pandemic are projected to result in an estimated 4,000 to 7,000 excess cancer-related deaths by 2040 [1]. Colorectal cancer (CRC) is the second leading cause of cancer-related deaths in the United States [1].

In Ukraine, colorectal cancer (CRC) ranks among the top three malignancies in terms of incidence and is the second leading cause of cancer mortality, accounting for 9.9% and 14.4% respectively [2]. The CRC mortality rate in Ukraine notably surpasses the global average of 9.3% [3].

Consequently, addressing the burden of colorectal cancer constitutes a critical priority for the national healthcare system. Following the implementation of the 2017 reform in healthcare sector [4], the proportion of government healthcare spending increased from 44.8% in 2019 to 51% in 2021. This contributes to reducing the financial burden on households, however, approximately half of all healthcare expenditures still fall on out-of-pocket (OOP) payments. The World Health Organization (WHO) estimated these expenses at 48% in 2020, which is higher than the 31% for EU candidate countries and the 19% EU average [5]. Another systematic review estimates the level of OOP payments for cancer patients and their family caregivers in low- and middle-income countries at 42% [6].

Furthermore, the study authors indicate that the expenditure of 4% of GDP in Ukraine before the full-scale military invasion was the lowest among all EU countries and EU candidates, except for Albania and Turkey. However, the latter two countries have a higher GDP per capita at purchasing power parity than Ukraine [5].

A review of financial toxicity, which focused on high-income (80% of the studies) and middle-income (20%) countries, estimated the annual direct costs of CRC treatment at $2,045–$10,772, with an additional $551–$795 in indirect costs [7]. It is also known that the lower the GDP, the more prevalent OOP payments are among patients [8].

According to the reform framework, the National Health Service of Ukraine (NHSU) serves as the single public purchaser of healthcare services [4]. To implement the Program of Medical Guarantee (PMG), medical service packages were established, outlining provider requirements (staff, equipment, etc.), reimbursement rates (capitation, fee-for-service, diagnosis-related groups (DRGs), etc.), and other essential details. The current study of CRC chemotherapy falls under the package «Chemotherapeutic treatment and support of patients with oncological diseases in inpatient and outpatient settings». Treatment within this package is state-guaranteed and is free of charge for patients. However, OOP payments remain highly prevalent [5].

AIM

To develop a risk prediction model for OOP payments based on organizational and regional features of CRC chemotherapy, patient sociodemographic and clinical characteristics.

MATERIALS AND METHODS

A cross-sectional study was conducted involving 459 patients undergoing chemotherapy (CT) for colorectal cancer between July 1, 2023, and June 30, 2024. The response rate was 98.7%. The survey encompassed the entire territory of Ukraine, excluding the Donetsk, Luhansk, and Kherson regions, as well as the Autonomous Republic of Crimea. These regions were excluded due to security constraints resulting from the full-scale russian invasion started in February 2022. The respondents were stratified into two groups based on whether they incurred OOP payments during their chemotherapy for CRC: those who made OOP payments (n = 121) and those who did not (n = 338).

The questionnaire assessed various domains, including patients' sociodemographic characteristics (sex, age, education level, average monthly income per household member, place of residence, and subregion), as well as clinical parameters. The latter included cancer stage, waiting time to treatment initiation, body mass index (BMI) calculated from self-reported weight and height 5 years prior to the onset of CRC symptoms, and current BMI at the time of the survey calculated using the same method. Subregional stratification was based on the territorial division defined by the NHSU [9].

Statistical data analysis was performed using the R programming language version 4.3.1 with the EZR graphical user interface version 1.64. Univariable and multivariable logistic regression models were used to calculate the odds ratios (ORs) and identify factors associated with incurring OOP payments. The threshold for statistical significance across all tests was set at $p < 0.05$.

RESULTS

The survey results for the two respondent groups, along with the comparisons between them using the $\chi 2$ test or Fisher's Exact Test (when the expected frequency in any cell was less than 5), are presented in Table 1.

The groups differed significantly by age ($p = 0.049$), subregion ($p < 0.001$), and BMI at the time of the survey ($p < 0.001$).

However, no statistically significant differences were observed across the remaining variables. A detailed analysis of the patients' sociodemographic and clinical profiles, along with a broader range of surveyed variables, reported elsewhere; therefore, these aspects are not discussed extensively in the current paper. Initially, a univariable logistic regression analysis was performed for each variable to calculate the crude odds ratios (ORs) and 95% confidence intervals (CIs) (Table 2).

Table 1

Sociodemographic and Clinical Characteristics of Respondents Stratified by Out-of-Pocket Payment Status

Variable	Category	Out-of-Pocket Payments		p
		NO, *n*=338	YES, *n*=121	
		n (%)	n (%)	
Sociodemographic characteristics				
Age, years	< 50	68 (20.1)	13 (10.7)	0.049
	50-59	83 (24.6)	26 (21.5)	
	60-69	130 (38.5)	61 (50.4)	
	≥ 70	57 (16.9)	21 (17.4)	
Sex	Female	103 (30.5)	41 (33.9)	0.562
	Male	235 (69.5)	80 (66.1)	
Education level	Higher education	105 (31.1)	35 (28.9)	0.893
	Secondary education	51 (15.1)	18 (14.9)	
	Vocational education	182 (53.8)	68 (56.2)	
Average monthly income per household member, UAH, (~EUR)	< 4,000 (< 92)	79 (26.1)	24 (21.6)	0.619
	4,001-7,000 (92-162)	83 (27.4)	36 (32.4)	
	7,001-10,000 (162-231)	57 (18.8)	18 (16.2)	
	> 10,000 (> 231)	84 (27.7)	33 (29.7)	
Place of residence (population in thousands)	Regional center	148 (43.8)	62 (51.2)	0.304
	Large cities (> 100)	48 (14.2)	20 (16.5)	
	Towns (< 100)	62 (18.3)	18 (14.9)	
	Rural areas	80 (23.7)	21 (17.4)	
Subregion of Ukraine	West	125 (37.0)	27 (22.3)	< 0.001
	North	27 (8.0)	39 (32.2)	
	East and South	74 (21.9)	12 (9.9)	
	Center	112 (33.1)	43 (35.5)	
Clinical characteristics				
Cancer stage	Localized (0–II)	215 (70.3)	70 (61.9)	0.107
	Locally advanced (III)	69 (22.5)	28 (24.8)	
	Advanced (IV)	22 (7.2)	15 (13.3)	
Waiting time to treatment initiation, months	≤ 1	231 (69.6)	69 (60.0)	0.114
	1-2	47 (14.2)	18 (15.7)	
	> 2	54 (16.3)	28 (24.3)	
BMI 5 years prior to CRC symptoms	Underweight (< 18.5)	4 (1.2)	0 (0.0)	0.751
	Normal weight (18.5-24.9)	90 (27.9)	34 (31.5)	
	Overweight (25.0-29.9)	158 (48.9)	50 (46.3)	
	Obesity (≥ 30.0)	71 (22.0)	24 (22.2)	
BMI at the time of survey	Underweight (< 18.5)	10 (3.0)	16 (13.6)	< 0.001
	Normal weight (18.5-24.9)	172 (51.5)	66 (55.9)	
	Overweight (25.0-29.9)	125 (37.4)	28 (23.7)	
	Obesity (≥ 30.0)	27 (8.1)	8 (6.8)	

Table 2

Univariable and Multivariable Logistic Regression Models for Predicting the Risk of Out-of-Pocket Payments During Chemotherapy for Colorectal Cancer

Variable	Category	Univariable model		Multivariable model, (Stepwise AIC)	
		Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
Age, years	< 50	1.00 (Reference)			
	50-59	1.64 (0.78-3.43)	0.190	2.10 (0.78-5.66)	0.143
	60-69	2.45 (1.26-4.78)	0.008	3.57 (1.42-9.02)	0.007
	≥ 70	1.93 (0.89-4.19)	0.098	2.62 (0.86-7.98)	0.090
Sex	Female	1.00 (Reference)			
	Male	0.85 (0.55-1.33)	0.488	NA	NA
Education level	Higher education	1.00 (Reference)			
	Secondary education	1.06 (0.55-2.05)	0.865	NA	NA
	Vocational education	1.12 (0.70-1.80)	0.637	NA	NA
Average monthly income per household member, UAH, (~EUR)	< 4,000 (< 92)	1.00 (Reference)			
	4,001-7,000 (92-162)	1.43 (0.78-2.61)	0.246	2.02 (0.94-4.36)	0.072
	7,001-10,000 (162-231)	1.04 (0.52-2.09)	0.914	0.70 (0.27-1.82)	0.462
	> 10,000 (> 231)	1.29 (0.70-2.38)	0.408	1.85 (0.78-4.39)	0.165
Place of residence (population in thousands)	Regional center	1.00 (Reference)			
	Large cities (> 100)	0.99 (0.55-1.82)	0.986	NA	NA
	Towns (< 100)	0.69 (0.38-1.27)	0.233	NA	NA
	Rural areas	0.63 (0.36-1.10)	0.105	NA	NA
Subregion of Ukraine	West	1.00 (Reference)			
	North	6.69 (3.52-12.72)	< 0.001	9.09 (3.88-21.28)	< 0.001
	East and South	0.75 (0.36-1.57)	0.447	0.48 (0.18-1.29)	0.146
	Center	1.78 (1.03-3.06)	0.038	2.54 (1.27-5.07)	0.008

Table 2 (continued)

Variable	Category	Univariable model		Multivariable model, (Stepwise AIC)	
		Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
Cancer stage	Localized (0–II)	1.00 (Reference)			
	Locally advanced (III)	1.25 (0.74-2.09)	0.402	NA	NA
	Advanced (IV)	2.09 (1.03-4.26)	0.041	NA	NA
Waiting time to treatment initiation, months	≤ 1	1.00 (Reference)			
	1-2	1.28 (0.70-2.35)	0.422	1.41 (0.66-3.00)	0.372
	> 2	1.74 (1.02-2.95)	0.041	2.46 (1.18-5.16)	0.017
BMI 5 years prior to CRC symptoms	Normal weight (18.5-24.9)	1.00 (Reference)			
	Underweight (< 18.5)	0.00 (0.00–Inf)	0.984	NA	NA
	Overweight (25.0-29.9)	0.84 (0.50-1.39)	0.493	NA	NA
	Obesity (≥ 30.0)	0.90 (0.49-1.64)	0.720	NA	NA
BMI at the time of survey	Normal weight (18.5-24.9)	1.00 (Reference)			
	Underweight (< 18.5)	4.17 (1.80-9.65)	< 0.001	4.52 (1.53-13.35)	0.006
	Overweight (25.0-29.9)	0.58 (0.35-0.96)	0.034	0.49 (0.26-0.94)	0.033
	Obesity (≥ 30.0)	0.77 (0.33-1.79)	0.546	1.07 (0.36-3.19)	0.901

The statistically significant variables identified in the univariable models are presented above. Among these, the following factors were associated with increased risks of incurring OOP payments compared with their respective reference categories: age 60-69 (p = 0.008), the Northern and Central subregions (p < 0.001, p = 0.04 respectively), advanced (stage IV) cancer (p = 0.04), more than 2 months of waiting time to treatment initiation (p = 0.04), being underweight (BMI < 18.5, p < 0.001). The only variable acting as a protective factor, associated with decreased odds of incurring OOP payments, was being overweight (BMI 25.0-29.9; p = 0.03).

A trend toward increased odds of incurring OOP payments, though not reaching statistical significance, was observed for the remaining age category 50-59 years (p = 0.19). Additionally, a non-significant protective trend was noted for patients residing in rural areas (villages and rural settlements) compared with those living in regional centers (p = 0.11).

At step two, an automated stepwise variable selection based on the Akaike Information Criterion (stepwise AIC) was applied. Table 2 presents the adjusted ORs and 95% CIs. No multicollinearity was detected in the model (actual Generalized Variance Inflation Factor [GVIF] values did not exceed the threshold of 5). Five of the ten initial variables were retained in the final model: age, income, subregion, BMI at the time of the survey, and waiting time to treatment initiation. The area under the curve (AUC) for the 5-variable model was 0.798 (0.744-0.851). The receiver operating characteristic (ROC) curve is presented in Figure 1. The model demonstrates very good concordance.

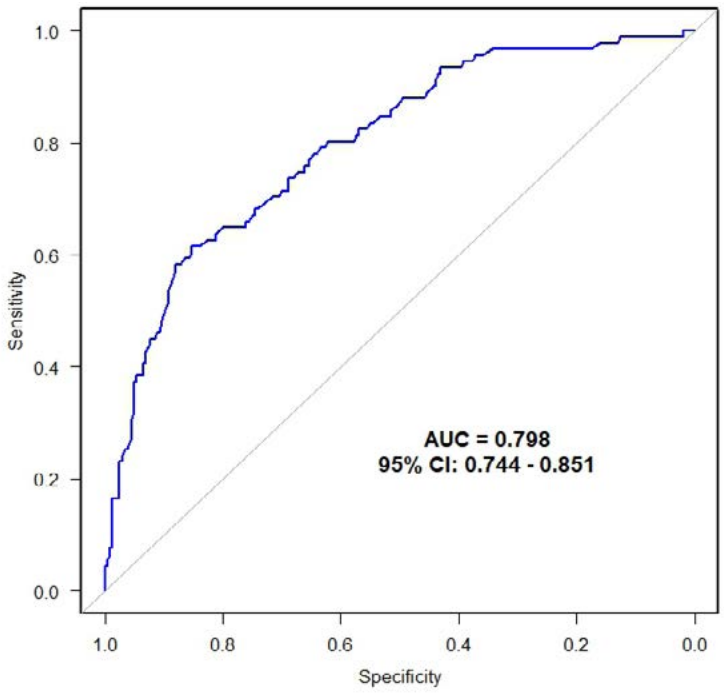

Figure 1. Receiver operating characteristic (ROC) curve of the 5-variable logistic regression model for predicting out-of-pocket payments.

Regarding the specific model estimates, being in the 60-69 age group was associated with a 3.6-fold increase in the odds of incurring OOP payments (p = 0.007). Compared with the Western subregion, the odds of making such payments were 9.1 times higher in the Northern subregion (p < 0.001) and 2.5 times higher in the Central subregion (p = 0.008). Income level was retained in the model but did not demonstrate an independent, statistically significant association (all p > 0.05). Nevertheless, the inclusion of this variable in the final model was necessary to control for the potential confounding effects of income.

Among the clinical variables, being underweight was significantly associated with 4.52 times higher odds of incurring OOP payments compared with having a normal weight (p = 0.006). Conversely, being overweight acted as a protective factor (p = 0.033). The association for the obesity category did not reach statistical significance (p = 0.90). Notably, compared with patients who initiated treatment within 1 month of diagnosis, those with a waiting time of more than 2 months had 2.5 times higher odds of incurring OOP payments (p = 0.017).

DISCUSSION

According to the WHO report «Can people afford to pay for health care?», 96% of households in Ukraine incurred OOP health care expenses in 2021 (based on household budget surveys). It is of particular concern that the most substantial increase compared with 2018 (96% vs. 86%) occurred among the poorest households. Furthermore, the report identified several key factors associated with catastrophic health expenditures, namely: belonging to poorer households, having a household headed by an older adult or pensioner, and residing in rural areas [10].

Donkor et al. in a systematic review and meta-analysis of cancer care in low- and middle-income countries identified several statistically significant factors associated with financial toxicity. These included receiving multiple cycles of chemotherapy, undergoing treatment in private healthcare facilities, and having a household size of more than four members [11]. According to the National Cancer Institute (NCI) in the United States, financial toxicity in the context of healthcare delivery is defined as the adverse impact of medical care costs on patients or their families. This phenomenon occurs when paying for medical services or making informal/additional payments creates a financial burden, causes debt and stress, or forces patients to delay or alter their treatment [12].

Compared with the study, although household size was not evaluated as a distinct variable, it was indirectly assessed through the average income per a household member, which was retained in the final risk prediction model for OOP payments. Furthermore, the number of chemotherapy cycles was analyzed in the authors' other published work; however, it was excluded from the candidate variables in the current modeling. This decision was methodologically driven, as the number of cycles is not a baseline predictor but rather a parameter that can only be evaluated retrospectively.

Additionally, according to the above-mentioned meta-analysis, risk factors for OOP payments that did not reach statistical significance included age, sex, education level, income level, and disease stage [11]. This partially aligns with the findings of the multivariable model, as sex, education level, and disease stage were also not statistically significant and, as a result, were not retained in the final predictive model. In contrast, age demonstrated statistical significance in this cohort and income level, despite lacking statistical significance, was also retained in the final predictive model.

According to the literature, factors typically associated with OOP payments among cancer patients include female sex, younger age, residing in developing countries, receiving a diagnosis after COVID-19, and having lung cancer [13]. However, in this study, sex did not reach statistical significance as a predictor of OOP payments. Conversely, regarding age, an older age group (60-69 years; p = 0.007) demonstrated a significant association. The impact of COVID-19 was not evaluated in the current analysis.

According to Shao et al. [14], factors associated with financial toxicity during the treatment of colorectal cancer include sex, age, education level, marital status, insurance status, and disease stage. However, except for age, none of these variables were retained in the final predictive model.

Thus, the literature reveals inconsistent findings, and to date, there is no universally accepted set of predictors. Nevertheless, the general pool of variables used for prediction frequently comprises the same sociodemographic and clinical patient characteristics.

According to the National Comprehensive Cancer Network (NCCN) guidelines for the management of colon and rectal cancer, body mass index can serve as a prognostic indicator. Specifically, a low BMI may be associated with an increased risk of disease progression and mortality in metastatic colorectal cancer, whereas being slightly overweight acts as a protective factor [15,16]. It is plausible that patients tend to perceive weight loss as an indicator of a poor disease prognosis, prompting them to spend additional funds in an effort to improve their health status.

In this study, patient BMI was a statistically significant predictor of OOP payments in both univariable and multivariable analyses. Specifically, patients who were underweight (BMI < 18.5) had 4.5 times higher odds of incurring OOP payments (p = 0.006). Conversely, being overweight (BMI 25.0-29.9) was associated with a 51% reduction in the odds of incurring OOP payments (p = 0.033). Presumably, underweight patients and those with

signs of malnutrition tolerate chemotherapy more poorly and may more frequently face treatment denial due to their clinical condition. Additionally, they may have more advanced cancer, presenting with complications such as bowel obstruction, cachexia, or asthenia etc. As a result, much like patients who are waiting more than 2 months for treatment, they are more likely to resort to OOP payments as a strategy to overcome healthcare access barriers and potentially improve their clinical outcomes.

To sum it up, the developed predictive model for OOP payments among patients with CRC undergoing chemotherapy can be integrated into the electronic healthcare system of Ukraine (eHealth) to create independent, automated risk-scoring algorithms.

CONCLUSIONS

The prognostic model reveals that the risk of incurring OOP payments is primarily driven by clinical parameters (underweight, BMI < 18.5; and overweight, BMI 25.0-29.9), access to care (waiting time of more than 2 months), socio-demographic factors (age 60-69 years), and regional disparities in healthcare delivery.

Actionable strategies for rapid implementation to mitigate OOP payments include optimizing healthcare organization to reduce treatment waiting times, increasing patient awareness regarding free treatment, as well as for the development of independent, automated risk-scoring algorithms for OOP payments within the electronic healthcare system (eHealth).

Perspectives for further research. In future studies, it is highly relevant to investigate the impact of sociodemographic and clinical characteristics among CRC patients undergoing surgery. Furthermore, there is a need to evaluate the role of healthcare facility-level variables as factors contributing to out-of-pocket payments.

Study limitations. The study has several limitations, which are defined by topic, study design, wartime constraints, and the timeframe of the survey. Data collection covered only a single-year period during the ongoing full-scale invasion in Ukraine. The current work is also limited to the chemotherapeutic treatment of colorectal cancer. It is valuable for future research to focus on all treatment modalities received by patients, including surgical treatment and radiotherapy. Moreover, the study did not assess the broader economic and financial sustainability of healthcare facilities as well as management of essential medical inventory and materials, health staff salaries. All weight- and height-related metrics are calculated from patients' self-reported data. This might be a less reliable and consistent approach than data measured by researchers. Nevertheless, the level of abstraction of the current research allows for such an approach, which also provides broad data availability. Additionally, the research primarily focused on out-of-pocket payments as a binary variable (presence or absence). Furthermore, this study does not include psychological components and behavioral factors that influence patients' decision-making processes to make OOP payments.

Primary data and materials. The authors of the research certify that the primary medical records (questionnaire data) are retained by the authors and can be provided upon reasonable request. All statements and conclusions are supported by references to primary sources available either in open access or through academic library resources.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was conducted in accordance with the standards and principles of the World Medical Association Declaration of Helsinki «Ethical Principles for Medical Research Involving Human Participants». During the survey, all participants were guaranteed anonymity and assured that their data would be used exclusively in a deidentified, aggregated format. No personally identifiable information was collected. The study protocol was approved by the Commission on Bioethical Expertise and Research Ethics of the Bogomolets National Medical University (Protocol № 206, dated 25.05.2026).

Declaration of AI use. Artificial intelligence was not used in this work for text creation, data analysis, or image generation. All content was prepared by the authors, who take full responsibility for its accuracy, originality, and compliance with ethical standards. The authors have reviewed the entire content and confirm its accuracy, originality, and the absence of plagiarism.

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Резюме

МОДЕЛЬ ПРОГНОЗУВАННЯ РИЗИКІВ ПЛАТЕЖІВ З ВЛАСНОЇ КИШЕНІ ПАЦІЄНТІВ ПІД ЧАС ХІМІОТЕРАПЕВТИЧНОГО ЛІКУВАННЯ КОЛОРЕКТАЛЬНОГО РАКУ В УКРАЇНІ ПІД ЧАС ВІЙНИ

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Вступ. В Україні колоректальний рак (КРР) входить до трійки найпоширеніших онкологічних захворювань і посідає друге місце серед причин смертності від злоякісних новоутворень, становлячи відповідно 9,9% та 14,4%. Незважаючи на впровадження реформи охорони здоров'я та пов'язане з нею підвищення доступності медичної допомоги, проблема платежів з власної кишені (ПзВК) залишається актуальною.
Мета. Розробити модель прогнозування ризику здійснення платежів з власної кишені на основі організаційних і регіональних особливостей хіміотерапевтичного лікування колоректального раку, а також соціально-демографічних і клінічних характеристик пацієнтів.
Матеріали та методи. Проведено одномоментне поперечне дослідження, до якого залучено 459 пацієнтів, які проходили хіміотерапію (ХТ) з приводу колоректального раку в Україні. Учасників було розподілено на дві групи залежно від наявності платежів з власної кишені: із ПзВК (121 особа) та без ПзВК (338 осіб). Статистичний аналіз виконано з використанням мови програмування R версії 4.3.1 та графічної оболонки EZR версії 1.64. Для оцінки впливу досліджуваних факторів на ризик здійснення ПзВК застосовано логістичну регресію.
Результати. Побудовано п'ятифакторну модель логістичної регресії для прогнозування шансів здійснення ПзВ К. Модель продемонструвала добру дискримінаційну здатність: площа під ROC-кривою (AUC) становила 0,798 (95% ДІ: 0,744-0,851). До фінальної моделі увійшли такі статистично значущі предиктори підвищеного ризику здійснення ПзВК: вік 60-69 років ($p = 0,007$), лікування у Північному та Центральному субрегіонах ($p < 0,001$ та $p = 0,008$ відповідно), недостатня маса тіла (індекс маси тіла [ІМТ] <18,5; $p = 0,006$) та очікування початку лікування понад два місяці ($p = 0,017$). Водночас надмірна маса тіла (ІМТ 25,0-29,9) асоціювалася зі зниженням шансів здійснення ПзВК ($p = 0,03$). Середньомісячний дохід на одного члена домогосподарства був включений до фінальної моделі, однак не мав самостійного статистично значущого впливу ($p > 0,05$).
Висновки. Розроблена прогностична модель свідчить, що ризик здійснення ПзВК насамперед визначається клінічними чинниками (недостатня маса тіла з ІМТ <18,5 та надмірна з ІМТ 25,0-29,9), доступністю лікування (очікування початку лікування понад два місяці), а також соціально-демографічними (вік 60-69 років) і регіональними особливостями організації медичної допомоги. Перспективними напрямами зменшення фінансового навантаження на пацієнтів є скорочення часу очікування лікування шляхом оптимізації організації медичної допомоги та підвищення обізнаності пацієнтів щодо можливостей отримання безоплатного лікування.

Ключові слова: **організація надання медичної допомоги; фінансування охорони здоров'я; пацієнти; доступність медичної допомоги; медична допомога; соціально-економічні фактори; індекс маси тіла; рак**

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